# HIGHWAY POLICIES AND PROCEDURES MANUAL

**Maryland Department of Transportation**
**STATE HIGHWAY ADMINISTRATION**
**Office of Highway Development**
**Highway Design Division**

Director, Highway Development

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|---|---|---|
| **Chapter** | DESIGN | **Ref. No**.: D-92-02TS |
| **Section** | TYPICAL SECTIONS | **Effective:** |
| **Subject** | TRAFFIC BARRIER 'W' BEAM END TREATMENT | **Sheet:** 1 **of** 12 |

**Application:**
- ☒ DESIGN
- ☒ CONSULTANT ENGINEERING
- HYDRAULICS
- ☒ ENGINEERING SUPPORT
- ADMINISTRATION
- OTHER

**Directive:** It is the policy of the State Highway Administration to install traffic barrier end treatments on the ends of existing and proposed 'w' beam or concrete traffic barriers for all highway projects on the National Highway System (NHS), that meets Federal regulations.

**Purpose:** This directive provides guidance in the selection or method of treating the ends of 'w' beams or concrete shape traffic barriers.

**Application:** On all construction projects, the appropriate traffic barrier end treatment upgrades shall conform to the guidelines shown in Chart D-92-2TS-1.

Traffic barrier end treatments shall be installed as indicated on Flowcharts D-92-2TS-1 through 4 within this section. It should be noted that the flowcharts are guides and the user may find that all conditions are not covered.

**Maintenance of traffic.** Temporary traffic barrier end treatments shall be utilized during construction as indicated in Flowchart D-92-2TS-4. It shall be verified, that when using the appropriate end treatment, sight distance is not impaired.

| TYPE OF WORK | FUNDING | GUIDELINES FOR END TREATMENTS |
|---|---|---|
| New Construction | 70-72 | All end treatments must meet current Standards. |
| **3R** (Resurfacing/Safety)<br>Freeway | 77 | All end treatments must meet current Standards. |
| Non-Freeway | 77 | If a high speed & high volume roadway, all end treatments must meet current Standards.(a)(b) |
| Noise Abatement | 26 | All end treatments must meet current Standards. |
| Reconstruction<br>Geometric Improvements<br>Intersection Improvements | 76<br>83<br>84 | If the existing traffic barrier is disturbed or within a high speed & high volume roadway, the end treatment must meet current Standards.(a) |
| Bridge | 80 | If the existing traffic barrier is disturbed, the end treatment must meet current Standards |
| Maintenance | 14 | If the existing end treatment has been struck and damaged beyond repair, its replacement must meet current Standards. |
| Landscape/Streetscape<br>C.H.A.R.T.<br>Wetland Replacement<br>Rideshare<br>Reconstruct R/R X-ing<br>Rest Area/Information<br>Bridge Painting<br>Miscellaneous (Slide repair, Drainage, Safety, and Lighting)<br>Preventive Maintenance | | Does not require replacement of existing end treatments |

(a) High speed is ≥ 45 mph posted speed & high volume is > 10,000 ADT (existing traffic count)

(b) High speed & low volume on NHS, use compliant end treatment

**Chart D-92-2TS-1 Guidelines for traffic barrier end treatment upgrades**

**Definitions:**

**Gating.** The characteristic of an end treatment that would allow a vehicle impacting the nose of the unit at an angle to pass through the device.

**Non-Gating.** The characteristic of an end treatment that indicates that the unit will bring an impacting vehicle to a controlled stop after an angled nose impact.

**High Accident Location**. A location (intersection, spot or road segment) identified through a formal process as having a significantly higher accident frequency, rate and/or severity over a given period of time than that for similar locations, and as meriting specific consideration for remedial measures.

**Type A End Treatment.** Type A is the most preferred end treatment. The semi-rigid system is buried in the cut slope (see MD 605.01 and MD 605.01-01, -02, & -03). Apply proper flare rate of 12.5:1 to barrier.

**Type B End Treatment.** Type B (see MD 605.02) is used with single 'w' beam barrier. This gating system requires a 4 ft parabolic flare and should be used with sufficient grading. It may be used on the outside and in the median when there is sufficient clear area behind the system.

**Type C End Treatment.** Type C (see MD 605.03 and MD 605.04) is a single 'w' beam gating system designed to require no flare from the roadway. It may be used on the outside and in the median when there is sufficient clear area behind the system.

**Type D End Treatment.** Type D (see MD 605.05) is a double 'w' beam parallel gating system. It may be used in medians and in some gore applications where gating is not a major concern. Transitions to the concrete barrier are available for this end treatment. It may be used as an alternate to the Type F End Treatment when conditions are equal in application.

**Type E End Treatment.** Type E (see MD 605.06 & MD 605.06-01) is a non-gating system. This end treatment can be used with double 'w' beam or concrete barrier and is beneficial for narrow median applications.

**Type F End Treatment.** Type F (see MD 605.07) is a double 'w' beam parallel non-gating system. This system can be used in the median and gore areas. It is also beneficial in rock areas and may be used as an alternate to the Type D End Treatment when conditions are equal in application. Transitions to the concrete barrier are available for this end treatment.

**Type G End Treatment.** Type G is a single beam turn down treatment and may be used on traffic barrier when posted speeds are 40 mph or less (see MD 605.08 and MD 605.08-01). This system may be used on top of curbed sections.

**Type H End Treatment.** Type H is a double beam turn down treatment and may be used on traffic barrier when posted speeds are 40 mph or less (see MD 605.09). This may be used on top of curbed sections.

**Type I End Treatment.** Type I is a single beam treatment for terminating the trailing end of traffic barrier where there is no opposing traffic within 30 ft of the barrier. It may be used on entrances to terminate a radius beam panel (see MD 605.10 and MD 605.10-01).

**Type J End Treatment.** Type J (see MD 605.11) is a reusable system that has a minimal repair time and can take several hits without damage to the structural integrity of the components. This system may be used on high speed, high volume unidirectional locations. It may be used with double 'w' beam or concrete barrier. This non-gating system may also be used as an alternate to Type E when conditions are equal in application.

**General:**

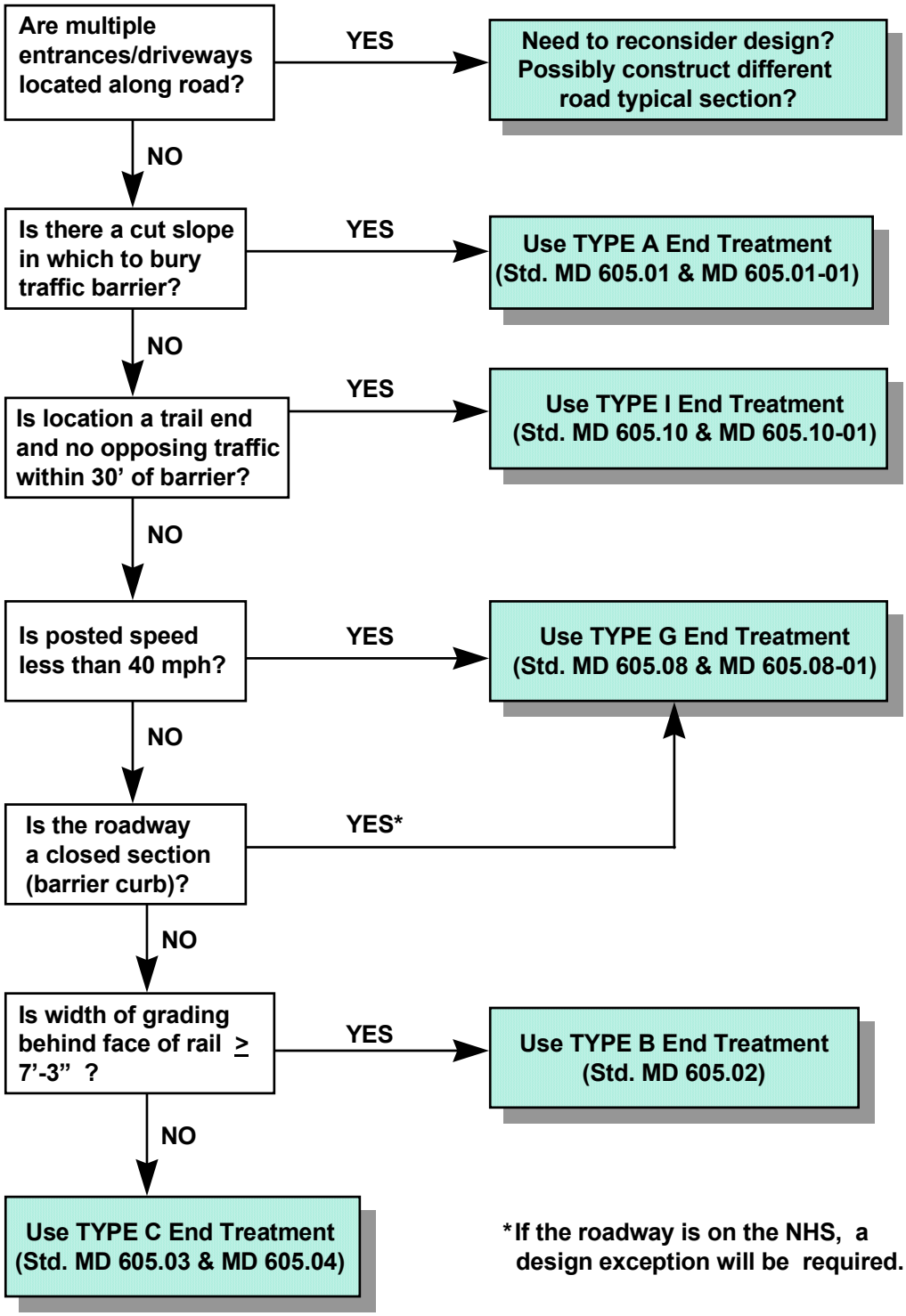
1. When two end treatments are within 200 ft of each other it may be more cost effective to join these sections of traffic barrier.

2. Careful attention shall be given to the placement of end treatments so that they do not impede maintenance operations.

3. It is important to provide the necessary approach surface grading adjustment for barrier end treatments so the system can operate at its maximum potential.

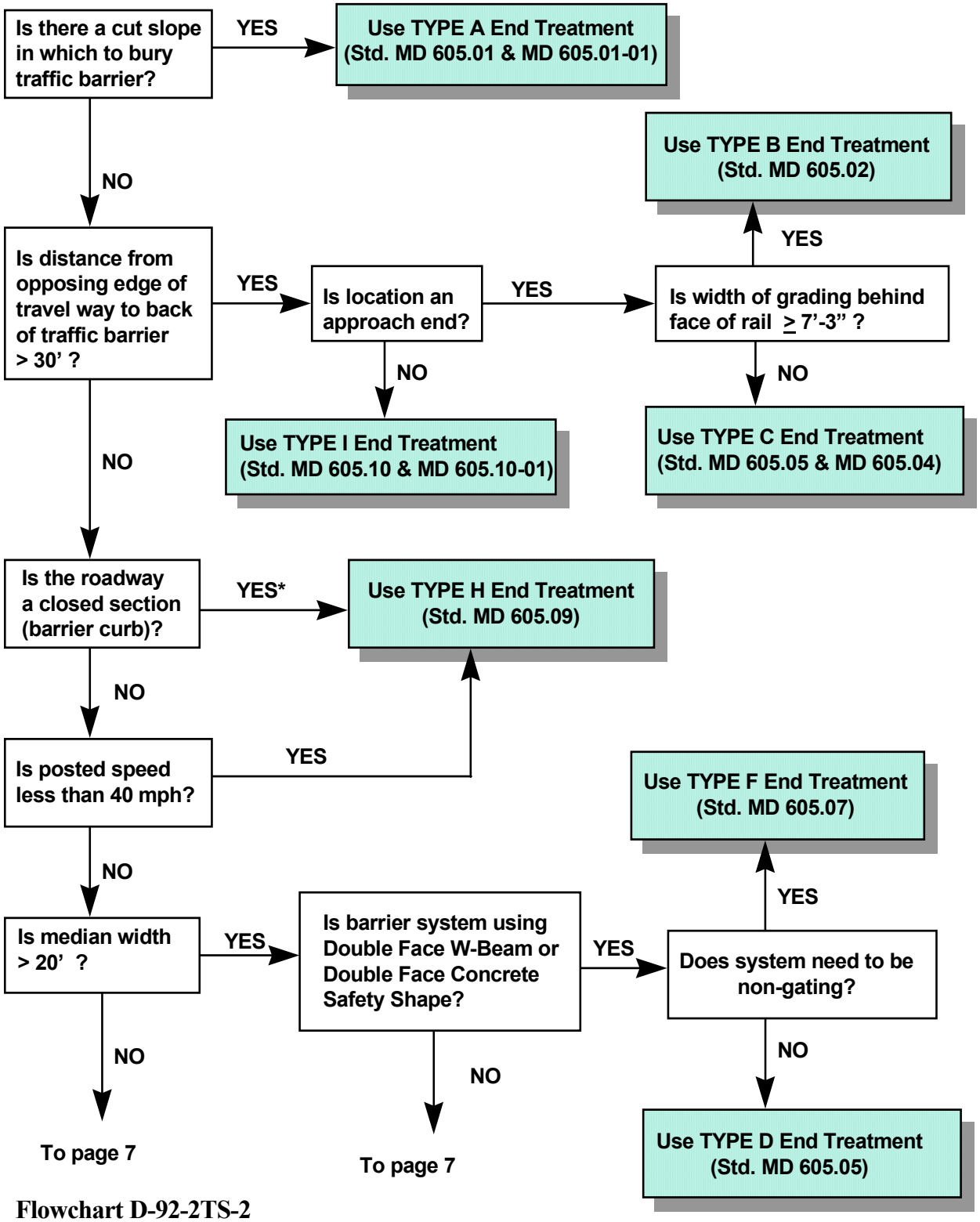
4. Type B, C, D, E, F, and J End Treatments shall not be placed next to or on top of curbed sections.

5. Engineering judgment shall be used to evaluate the feasibility of adjusting the length of the traffic barrier to utilize the Type A End Treatment (bury in cut slope).

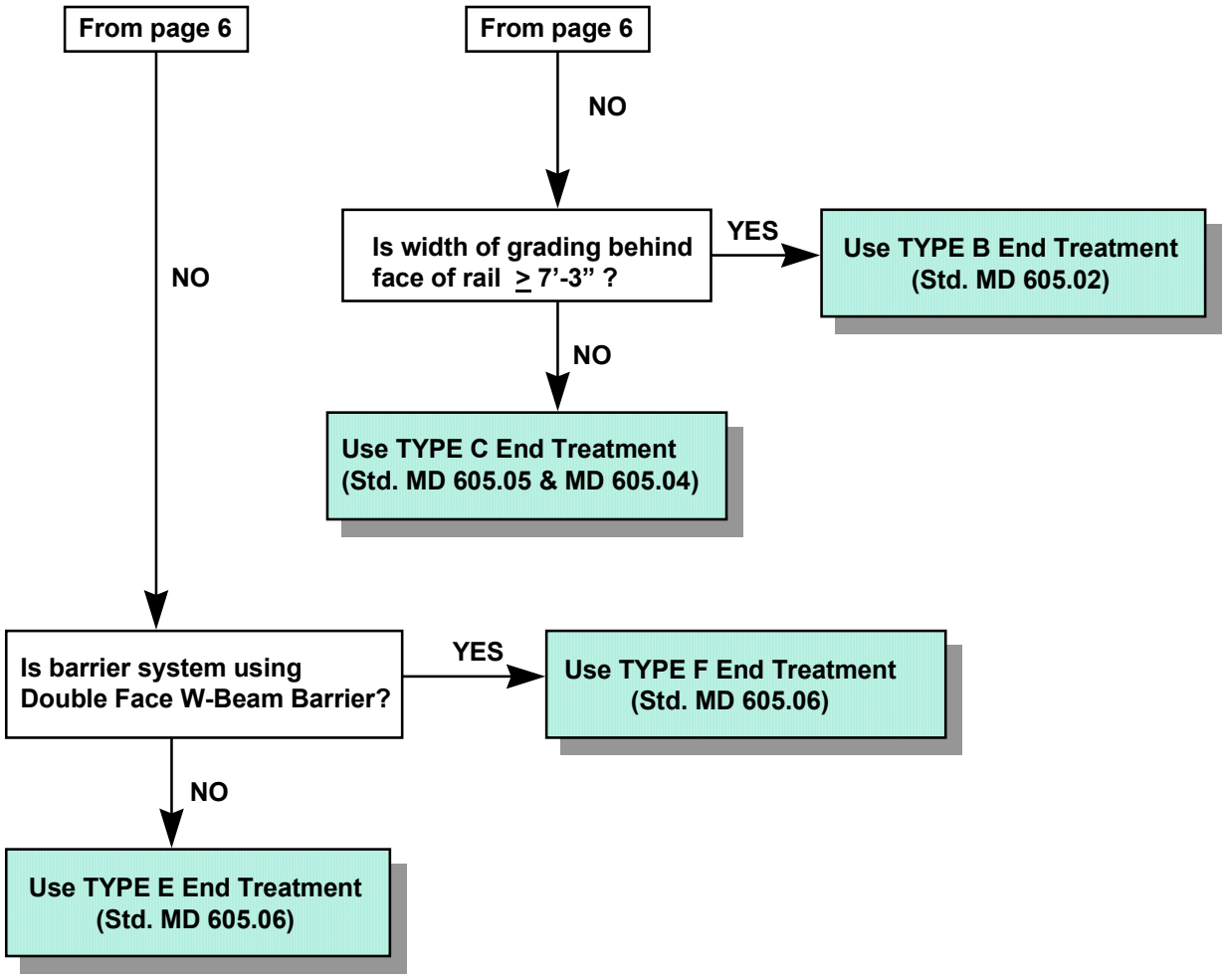



**Flowchart D-92-2TS-1**
**Roadside End Treatments**

**Provide necessary grading adjustments for end treatments to allow system to operate at maximum potential**

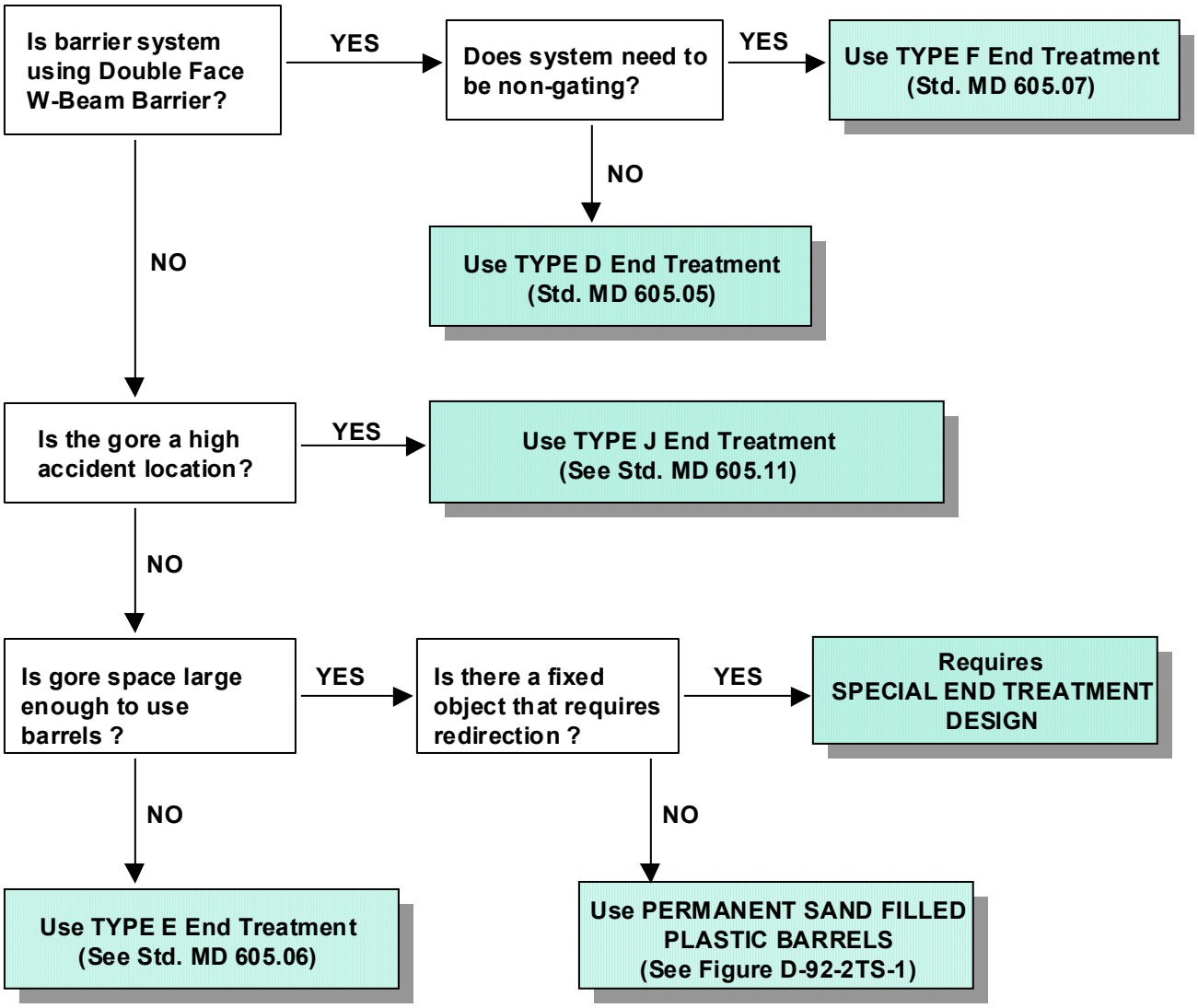



**Flowchart D-92-2TS-2**
**Median End Treatments**



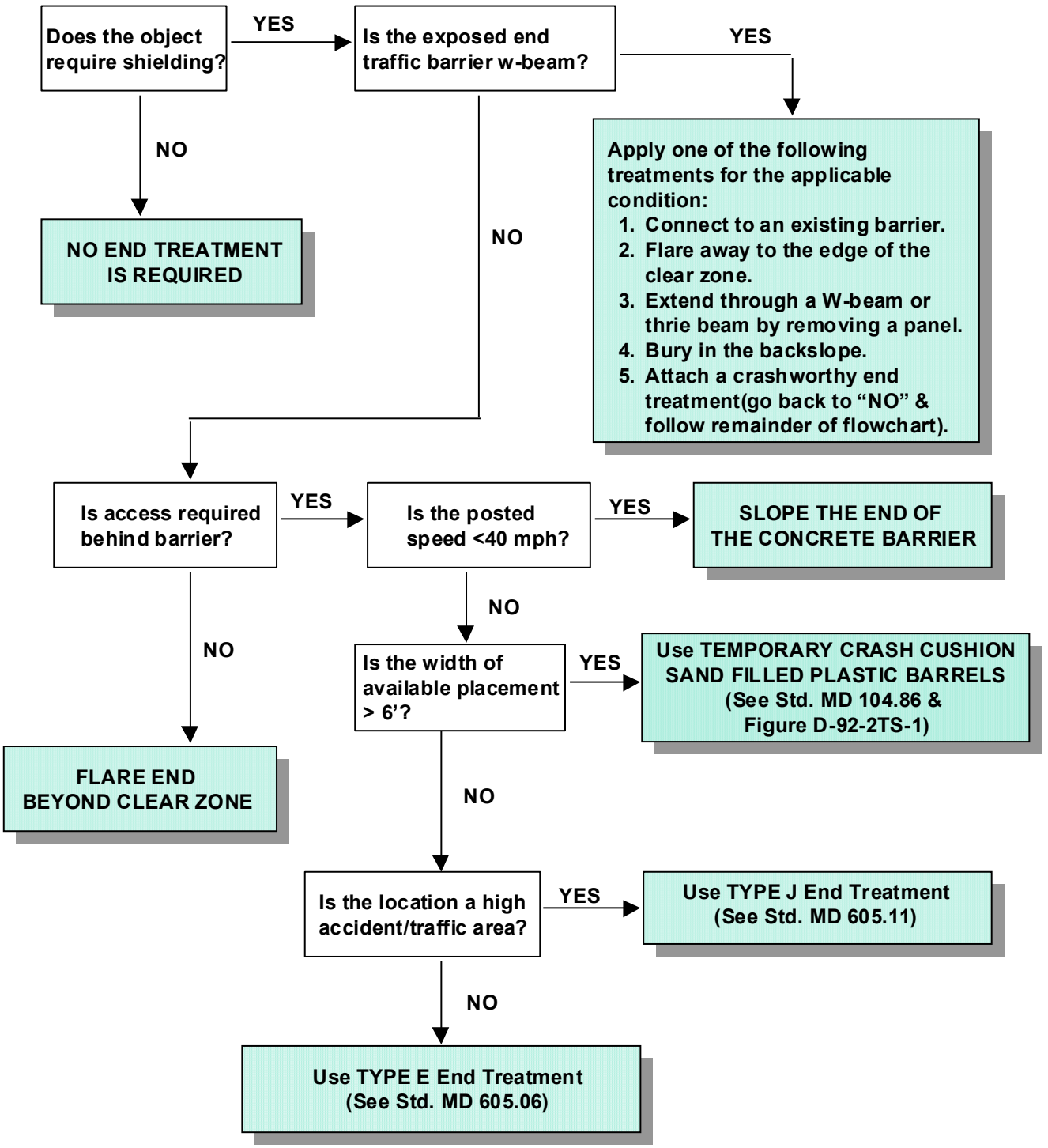

**Flowchart D-92-2TS-2 cont'd.**
**Median End Treatments**

Provide necessary grading adjustments for end treatments to allow system to operate at maximum potential




**Flowchart D-92-2TS-3**
**Gore End Treatments**

Provide necessary grading adjustments for end treatments to allow system to operate at maximum potential




**Flowchart D-92-2TS-4**
**Maintenance of Traffic**
**End Treatments**

Provide necessary grading adjustments for end treatments to allow system to operate at maximum potential

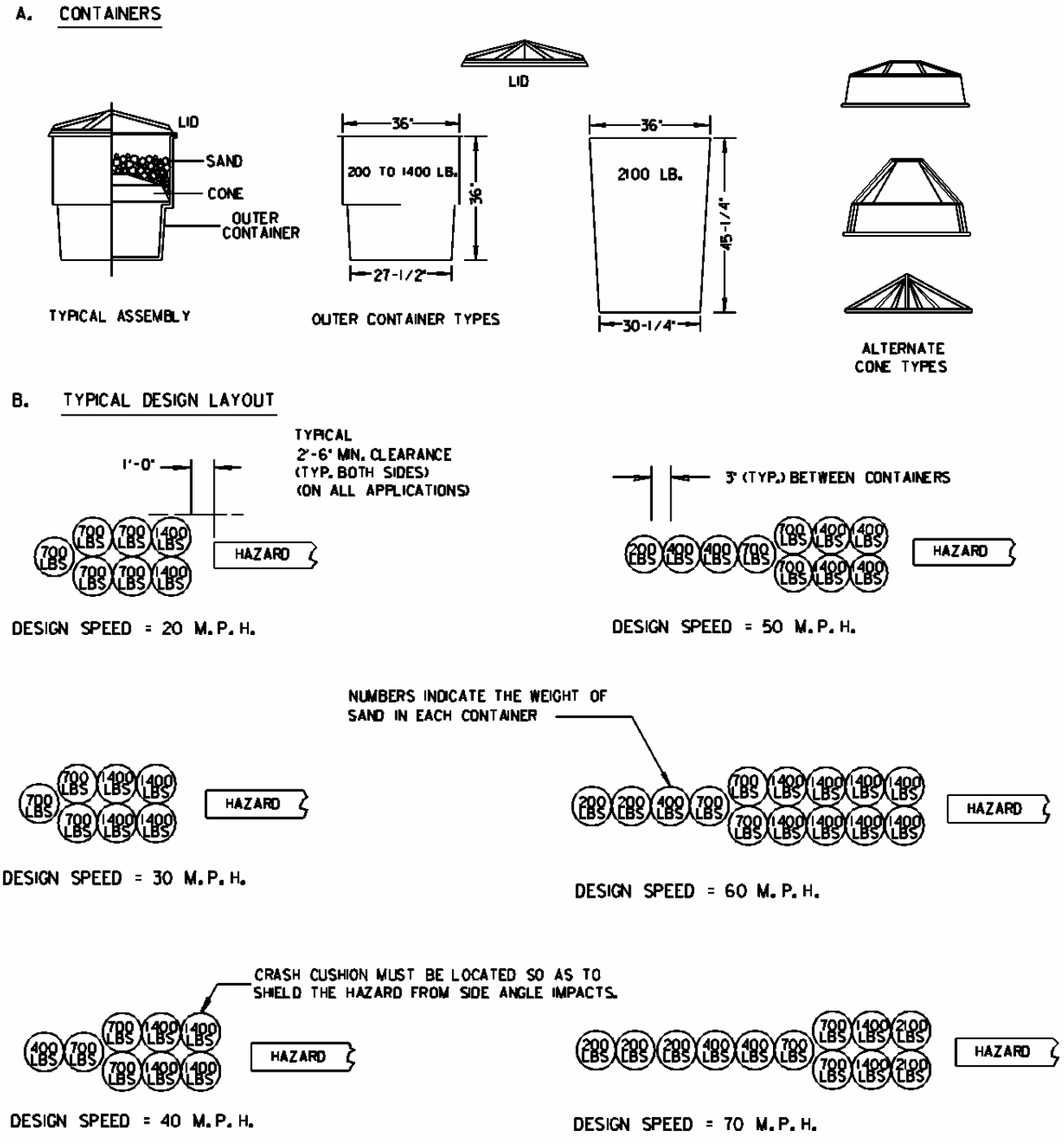



**Figure D-92-2TS-1**

| ROADSIDE | | | | |
|---|---|---|---|---|
| **END TREATMENT (MD Std. No.)** | **BARRIER SYSTEMS** | **GRADING REQUIREMENTS** | **APPLICATIONS** | **ESTIMATED COSTS** |
| Type A MD 605.01 & MD 605.01-01 | Single 'w' beam | Bury in cut slope | Open sections any posted speed | $-$$$ |
| Type B MD 605.02 | Single 'w' beam | 7'-3" @ 10:1 Maximum slope | Open sections > 40 mph posted speeds | $$ |
| Type C MD 605.03 & MD 605.04 | Single 'w' beam | 3'-3" @ 10:1 Maximum slope | Open Sections > 40 mph posted speeds | $$$ |
| Type G MD 605.08 & MD 605.08-01 | Single 'w' beam | Approximately 6 ft @ 6:1 or flatter | Open sections ≤ 40 mph posted speeds & closed sections any speed | $ |
| Type I MD 605.10 & MD 605.10-01 | Single 'w' beam | None | Open & closed sections, non-approach ends @ any posted speed | $ |

| MEDIANS | | | | |
|---|---|---|---|---|
| **END TREATMENT (MD Std. No.)** | **BARRIER SYSTEMS** | **GRADING REQUIREMENTS** | **APPLICATIONS** | **ESTIMATED COSTS** |
| Type A MD 605.01 & MD 605.01-01 | Single 'w' beam | Bury in cut slope | Open sections any posted speed | $-$$$ |
| Type B MD 605.02 | Single 'w' beam | 7'-3" @ 10:1 Maximum slope | Medians > 30 ft in width & > 40 mph posted speeds | $$ |
| Type C MD 605.03 & MD 605.04 | Single 'w' beam | 3'-3" @ 10:1 Maximum slope | Medians > 30 ft in width & > 40 mph posted speeds | $$$ |
| Type D MD 605.05 | Double 'w' beam | 10:1 maximum on graded slopes | Medians > 20 ft in width & > 40 mph posted speeds | $$$$ |
| Type E MD 605.06 & MD 605.06-01 | Double 'w' beam or concrete safety shape | 10:1 maximum on graded slopes, 8:1 maximum on paved | Medians ≤ 20 ft in width & > 40 mph posted speeds | $$$$$ depends on # of bays |
| Type F MD 605.07 | Double 'w' beam | 10:1 max., 6:1 max. when barrier is 12 ft or more from shoulder | Non-gating & > 40 mph posted speeds | $$$$ |
| Type H MD 605.09 | Double 'w' beam | None | Open sections ≤ 40 mph posted speeds & closed sections any speed | $ |
| Type I MD 605.10 & MD 605.10-01 | Single 'w' beam | None | Non-approach ends & any posted speed | $ |

**Chart D-92-2TS-2 cont'd.**

| GORES | | | | |
|---|---|---|---|---|
| **END TREATMENT (MD Std. No.)** | **BARRIER SYSTEMS** | **GRADING REQUIREMENTS** | **APPLICATIONS** | **ESTIMATED COSTS** |
| Type D MD 605.05 | Double 'w' beam | 10:1 maximum on graded slopes | Where 2 rails of 'w' beam converge &> 40 mph posted speeds | $$$$ |
| Type E MD 605.06 & MD 605.06-01 | Double 'w' beam or concrete shape | 10:1 max. On graded slopes, 8:1 max. On paved surfaces | Non-gating, narrow gores & > 40 mph posted speeds | $$$$$ depends on # of bays |
| Type F MD 605.07 | Double 'w' beam | 10:1 maximum on graded slopes | Where 2 rails of 'w' beam converge & > 40 mph posted speeds | $$$$ |
| Type J MD 605.11 | Double 'w' beam or concrete shape | 10:1 max. On graded slopes, 8:1 max. On paved surfaces | Multiple hit locations, reusable & > 40 mph posted speeds | $$$$$$ depends on # of bays |

| MAINTENANCE OF TRAFFIC | | | | |
|---|---|---|---|---|
| **END TREATMENT** | **BARRIER SYSTEMS** | **GRADING REQUIREMENTS** | **APPLICATIONS** | **ESTIMATED COSTS** |
| Type E MD 605.06 & MD 605.06-01 | Double 'w' beam or concrete shape | Paved surface or concrete base | 2 ft min. width & > 40 mph posted speeds | $$$$ |
| Type J MD 605.11 | Double 'w' beam or concrete shape | Paved surface or concrete base | 4 ft min. width & > 40 mph posted speeds | $$$$$$ depends on # of bays |
| Temporary Crash Cushion Sand Filled Plastic Barrels MD 104.86 | Double 'w' beam or concrete shape | Paved or concrete surface | 3-6 ft min. width & any posted speed | $-$$$$ depends on # of barrels |
| Refer to Roadside Design Guide 9.1.1.4 for additional treatments | Double 'w' beam or concrete shape | Paved or concrete surface | Varies | |